

Remarks on the Value of the Secular Acceleration of the Moon's Motion derived from Observation. By Prof. Simon Newcomb.

In Thomson's and Tait's "Natural Philosophy," second edition, part ii. p. 415, and Appendix G, p. 503, are found discussions by the authors and by Professor Darwin of the earth's tidal retardation as deduced from various values of the Moon's secular acceleration. The statements of the origin and relations of these different values which accompany these discussions seems to me susceptible of some slight reconstruction, which I am induced to attempt from the belief that any incompleteness which may affect them arises from some defect in my own presentation of the subject, to which the authors refer. I remark first that the value $12''.56$, though clearly described in one passage as founded on erroneous theory, which it really is, is spoken of elsewhere as representing the ancient eclipses, and therefore to be regarded as a value derived from observations. In reality, however, this value is not compatible with any observational data whatever. It is true that Hansen's tables, into which a value little different from this is introduced, do represent the ancient eclipses of Thales and Larissa. But this happens through Hansen having used an erroneous mean motion of the Moon at the present epoch. The process of determining the acceleration from ancient eclipses consists essentially in carrying the place of the Moon back with its present mean motion to the epochs of the eclipses, and comparing the outstanding difference between the mean longitude thus computed and that given by the eclipse. Now, in consequence of Hansen's addition of an empirical term of long period to represent the Moon's place from 1750 to 1850, his centennial mean motion is about $29''$ in error. When this correction is applied, the acceleration is diminished by $1''.25$, thus making it $10''.9$ or $11''.3$ according to the value which is considered as best representing the data in question.

We may then say that $11''$ is the value which best represents the ancient solar eclipses referred to. But this does not exhaust the subject. In my discussion in *Researches on the Motion of the Moon* I showed that this value was incompatible with the great mass of astronomical data, especially the Ptolemaic and Arabian eclipses of the Moon. Since this publication new light has been thrown on the question from two quarters. The tendency of this new light is to establish the smaller value as nearer the truth.

I. As favouring the larger value I cited the incompatibility of the smaller value with a certain eclipse of the Moon supposed to have been observed at Babylon in the year B.C. 382. Now Dr. Oppolzer calls attention to the fact that Hipparchus does not describe this eclipse as actually observed at Babylon, but as being employed as if it had been there observed.

II. Celoria's ingenious research into the eclipse of Theon,

which was total in the Hellespont, seems to show that this was the eclipse of Agathocles; and, if so, the shadow passed north of Sicily. This is compatible only with the smaller value of the acceleration.

If we accept these conclusions or interpretations, nothing is left to support the larger value of the acceleration except the eclipses of Thales and of Larissa, while against it stands an array of evidence which I cannot but regard as many times stronger.

The Parallax of α Tauri. By Prof. Otto Struve.

(*Extract from a Letter to Mr. Gill.*)

With regard to parallaxes the following recent fact will be of some interest for you. During the last few weeks I have been engaged in preparing for publication my second volume of double star measures (vol. x. of the *Observations de Poulkova*). On this occasion I was struck with the remark that about thirty years ago I had collected for α Tauri twenty-five measures of each coordinate, and seeing that these measures were favourably distributed in different seasons, I proposed to one of my assistants, M. Shdanow, to investigate if they did not exhibit traces of a sensible parallax. The results of his computations were rather surprising. From the distances he found

$$\pi = +0''.500 \pm 0''.075,$$

and from the positions

$$\pi = +0''.538 \pm 0''.089.$$

the mean being

$$\pi = +0''.516 \pm 0''.057.$$

Such an annual parallax would hardly be expected for a star having so small a proper motion as α Tauri, but the agreement of the two values, obtained by two so totally different methods of observation as those of distance and direction, can certainly not leave a doubt as to the existence of a comparatively large parallax, though perhaps, according to the probable error, the real parallax might be somewhat less than that given by my measures.

If you think proper you have my authority to communicate this result to the Royal Astronomical Society.

Pulkowa: 1884, March 1.
